

Feedback Theory and Its Applications

By P. H. Hammond. (Applied Physics Guides.) Pp. 348. (London: English Universities Press, Ltd., 1958.) 35s. net.

A GOOD understanding of feedback theory is essential for electrical engineers and workers in allied fields. The basic principles of linear servo-mechanism theory have appeared in many books. Most practical servo-systems involve non-linear elements and it is pleasing to see that this field of study is well covered in this book in easily understandable form. A particular feature to be commended is the frequent description of practical electronic circuits, including values of components and details of operating conditions.

An introductory chapter gives the necessary mathematics for much of the work to follow, including Laplace transforms, differential equations and the convolution integral. The following chapters deal with basic linear feedback theory, including Routh's stability criterion and the Nyquist rule. In the latter the critical point is taken as $+1$ rather than the more conventional -1 .

The frequency response function is discussed in detail and Bode's relation between gain and phase characteristics is clearly explained. Feedback principles are illustrated in a number of electronic circuits, including cathode followers and virtual earth amplifiers. Methods of stabilizing amplifiers with several stages by the control of the frequency response are explained. Many applications of virtual earth amplifiers are given and a circuit using positive and negative feedback is described. A chapter is devoted to stabilization techniques applied to servomechanisms, and such topics as the use of derivative of error and integral control to reduce steady-state error are described.

The treatment so far given is inapplicable to many practical servo mechanisms because these use non-linear elements. The phase-plane technique is now explained and examples of its application are presented. The analysis of non-linear feedback systems presents considerable difficulties and one method is to employ frequency-response techniques and make use of describing functions. Further chapters describe on-off controlled servo mechanisms and simulation of servo mechanisms using analogue computers.

This book will be of great value to all workers requiring a thorough grasp of feedback principles.

R. L. GRIMSDALE

The Fabric of Farming

By Prof. A. N. Duckham. Pp. 224 + 8 plates. (London: Chatto and Windus, Ltd., 1958.) 15s. net.

PROF. A. N. DUCKHAM has written this book for first-year students, rural science teachers, and any others who are interested in the relation of agriculture to man. Such a public, while not likely to be looking for a profound treatise, will none the less expect the subject to be treated in a scientific manner. Prof. Duckham does this by considering the growth of agriculture from two points of view—the historical and the bio-geographical. He describes the development of farming from the days when man fed himself by taking the food he found in Nature, and hunting for animals and fish, to the complex undertaking that we know it to be to-day. He then discusses the influence of climate and of locality on type of farming, and the factors which result in extensive farming in some parts of the world, and intensive

farming in others. Intensity and complexity generally go together and in most modern systems the skill of farming is largely measured by the success with which natural and man-made resources are integrated to produce the highest income in relation to their cost. "Weaving the many components of modern farming into a living, persistent, and profitable fabric calls for managerial ability of a high order on the part of the individual farmer and for a vast array of industrial, technical and social supplies and services, that is, for a high level and a wide range of inputs of non-farm origin." This way of looking at farming is born of a different 'habit of thinking' from some schools of thought. It is certainly different from the conception of agriculture as a nucleus of husbandry with the so-called ancillary subjects or sciences to hand, ready to assist the main subject when called upon to do so. Prof. Duckham insists that integration is a 'mode of thought' rather than a 'set of principles'; this, indeed, gives the clue to his approach to his subject.

"The Fabric of Farming" will not compete with "Fream" or "Watson and More" as the students' *vade mecum* in his contests with examiners, but it will give him more ideas in 200 pages than many books two or three times as big.

HARWOOD LONG

Blood Groups in Man

By Dr. R. R. Race and Dr. Ruth Sanger. Third edition. Pp. xix + 377. (Oxford: Blackwell Scientific Publications, 1958.) 42s.

THIS is now the third edition of this book, which has been deservedly popular. Since the last edition many new blood-group antibodies have been discovered which define new blood-group antigens but, on the whole, these have been found to be associated with the known blood-group systems; indeed, the authors state that it looks as if we are nearing the end of the blood-group systems which can be detected by the tests in use up to now, and express the hope that for the future of the science of human genetics, and for the delight of blood groupers, many more systems exist and that their recognition only awaits the devising of suitable tests. This pin-points the importance of the technical advances in this field over the past few years, which have made so much progress possible, and also indicates the predominant interest of these workers in human genetics, which is more evident in this edition than it was in previous ones.

Much more is now known about certain blood groups, and their complexity has so increased that the chapters dealing with them have had to be lengthened; for example, no one would have thought, some years ago, that the P blood-group system would have attained the interest which it now has. All the new information has been included without increasing the size of the book, so that some subjects receive less space; for example, three chapters on Rh in a previous edition now become one. Where old material has been omitted a summary and references are retained—a help to those who are beginning their studies of this subject.

The authors state they have not altered the notation or adopted Prof. Ford's suggested blood-group notation, and this is a wise course to adopt in the present state of affairs; indeed, any such alterations ought to be by international agreement.

This book has now become an established favourite and the new edition will be welcomed by all those interested in human blood groups.

F. STRATTON